

## **REMARKS/ARGUMENTS**

Reconsideration of this application is requested. Claims 1-15, 18-24, 27 and 29 are in the case.

### **I. CLAIM OBJECTIONS**

Claim 18 is objected to as appearing twice in the claims. This has been corrected in the present response.

### **II. THE OBVIOUSNESS REJECTION**

Claims 15, 18-24, 27 and 29 are rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Carlier (US 6,271,272) further in view of Harclerode (US 5,240,657) and Berghmans (US 6,538,042) as evidenced by "Paraffin" ([www.wikipedia.com](http://www.wikipedia.com)) and "Primol 352" ([www.protoninter.com](http://www.protoninter.com)). The rejection is respectfully traversed.

As claimed, there is provided pre-expanded beads having a bulk density chosen from a range of from 40 to 190 g/l and containing by weight (a) 100 parts of a polymer of styrene having a mean molecular mass by weight  $M_w$  chosen from a range of from 180,000 to 250,000 and a molecular weight distribution calculated by the ratio of  $M_w$  to the mean molecular mass by number,  $M_n$ , in the range of from 2.1 to 2.5, (b) from 0.5 to less than 3.0 parts of at least one blowing agent, (c) from 0 to 0.4 part of at least one plasticising agent comprising an oil which is liquid at 20°C, having on average from 25 to 38 carbon atoms, a dynamic viscosity at 25°C of from 110 to 170 mPa.s and a density of from 0.8 to 0.9, and (d) less than 400 ppm of residual styrene monomer. The pre-expanded beads are expandable.

Carlier describes the use of high amounts of both blowing agent and plasticising agent. The lowest amount of blowing agent in Carlier is described in Example F, which is nearly 50% higher than the 0.5 to less than 3.0 parts range as presently claimed.

In addition, Carlier distinguishes between the situation where large amounts (6.5-9 pbw) of blowing agent are used and where smaller amounts of blowing agent are used (3-6.5 pbw). One of ordinary skill upon reading Carlier would have understood this to be saying that if the amount of blowing agent is to be reduced, then it is necessary to increase the amount of plasticising agent (i.e., wax). Carlier mentions a wax level of at least 0.1%. The exemplified levels are much higher. Moreover, as exemplified, Carlier uses a **solid** paraffin wax.

The presently claimed invention, on the other hand, employs an oil which is liquid at 20°C, and has on average from 25 to 38 carbon atoms, a dynamic viscosity at 25°C of from 110 to 170mPa.s and a density of from 0.8 to 0.9. This claimed feature is not disclosed or suggested by Carlier.

Moreover, Carlier stops polymerisation of the styrene at a relatively high monomer level. Carlier states (cols. 10 and 11) that polymerisation can be continued until monomer level is 2000ppm to “even less than 600ppm.” Carlier clearly regards 600ppm as very close to the limit. This is supported by the examples where Carlier ceases polymerisation at 750ppm.

The present invention employs a different approach. In the presently claimed invention, the polymerisation is longer and hotter in accordance with the examples of the invention than in accordance with the examples of Carlier, and results in a lower level, 200ppm, of monomer.

It is well known that the length and time of polymerisation reaction results in different polymers. The total reaction conditions giving rise to only 200ppm of polymer (Carrier) are clearly different from those giving rise to 750ppm (present invention). One of the effects on changed polymerisation conditions is likely to be that the molecular weight distribution (in other words the ratio of average molecular weight  $M_w$  to number average molecular  $M_n$ ) is changed.

It has been found, in accordance with the present invention that, by using a plasticiser as claimed which is **liquid** at 20°C, having on average from 25 to 38 carbon atom, a dynamic viscosity at 25°C of from 110 to 170mPa.s and a density of from 0.8 to 0.9, a styrene polymer with an average molecular weight  $M_w$  in the range 180,000 to 250,000, a molecular weight distribution in the range of from 2.1 to 2.5 and a residual monomer content of less than 400ppm is obtained. Moreover, contrary to Carrier, a combination of **both** low plasticiser level and low blowing agent can be achieved. This is surprising and would not have been expected by the skilled person based on the state of the art at the filing date of the present application.

Carrier clearly does not disclose or suggest the presently claimed pre-expanded expandable beads having, in combination, the features of:

- (1) a bulk density chosen from a range of from 40 to 190 g/l,
- (2) 100 parts of a polymer of styrene having a mean molecular mass by weight  $M_w$  chosen from a range of from 180,000 to 250,000 and a molecular weight distribution calculated by the ratio of  $M_w$  to the mean molecular mass by number,  $M_n$ , in the range of from 2.1 to 2.5,
- (3) from 0.5 to less than 3.0 parts of at least one blowing agent,

(4) from 0 to 0.4 part of at least one plasticising agent comprising an oil which is liquid at 20°C, having on average from 25 to 38 carbon atoms, a dynamic viscosity at 25°C of from 110 to 170mPa.s and a density of from 0.8 to 0.9,

(5) less than 400ppm of residual styrene monomer, and

(6) where the pre-expanded beads are expandable.

Combination of Carlier with the cited secondary art likewise does not suggest the claimed invention. Moreover, one of ordinary skill would not have been motivated to combine the cited references and, even if such a combination has been contemplated, the surprising result obtained by presently claimed would not have been suggested.

In order to possibly devise a product falling within the scope of the present claims, the skilled worker would have had to take Carlier's broad disclosure and select features which are within the broadest language used in Carlier but not actually contemplated by Carlier, and then modify the disclosure by incorporating, selectively, the features from a range of secondary art. This is beyond what the person of ordinary skill would have contemplated.

Carlier describes a Mw in the range 150 00 to 300 000. There would have been no motivation for one of ordinary skill to select from the broader Carlier range a narrower range of 180 00 to 250 000, because Carlier gives no information about Mw/Mn ratios.

The Action suggests that the skilled worker would overcome that deficiency by reliance on Harclerode and selecting from Harclerode's disclosure a portion of Harclerode's Mw. The Action then postulates that, having done that, the skilled worker would have had to select from Harclerode's disclosed Mw/Mn ratio of 1 to less than 2.5,

preferably 1 to less than 2.0 more preferably 1.5 to 2.0 and most preferably a value in the range 1.7 to 1.98 (column 17). Applicants disagree with this assertion.

The comment in the Action (page 4) regarding Mz:Mn ratio is irrelevant. The presently claimed invention makes **no** reference to z-average molecular weight. There is no reasonable likelihood (other than perhaps with the benefit of hindsight) that the person of ordinary skill might have selected Harclerode's non-preferred range. However, reliance on hindsight is an improper basis for rejection.

Neither Carlier nor Harclerode suggests the presence of oil as plasticising agent, and certainly not an oil with the features as presently claimed. The Action attempts to overcome this deficiency by relying on Berghmans (col. 5, lines 61-65). That passage reads:

"The vinyl arene comprised in the porous polymer particles of the present invention consists preferably mainly of styrene. The polyvinylarene may contain up to 10% mole of another vinyl-group containing monomer, such as acrylonitrile, acrylic or methacrylic acid or esters, substituted styrene, such as chlorostyrene, or  $\alpha$ -methyl styrene or divinyl benzene."

The above-quoted passage has nothing to do with the presence of oil. Berghmans does make reference to the use of "white oil". The Action attempts to extrapolate from the words "white oil" the particular oil as claimed. The Action does this by reliance on the Wikipedia article for paraffins. It would, however, have been more appropriate to have conducted a Wikipedia search for "white oil". If that is done, the article found relates to insecticidal sprays comprising water and detergent (with a note that the expression is also used in conjunction with "mineral oil"), as follows:

**"White oil** is a home made insecticide spray used for controlling a wide range of insect pests in the garden. The spray works by blocking the

breathing pores of insects causing suffocation and death. It is effective in the control of aphids, scale, mealybug, mites, citrus leaf miner and smooth skinned caterpillars.

"White oil" is also an alternative name for mineral oil. See [http://en.wikipedia.org/wiki/Mineral\\_oil](http://en.wikipedia.org/wiki/Mineral_oil)

Following that link, the reader is informed that mineral oil can be paraffinic oils, naphthenic oils or aromatic oils. Of all the possible meanings, the Action selects paraffinic oils and from the large class of paraffinic oils selects those having the claimed properties despite the existence of other oils, including paraffinic oils, having properties **outside** the claimed range being well known, as mentioned in the application as filed.

The reliance on **five** documents to support the assertion that the claimed invention is obvious is direct evidence of *ex-post facto* analysis. There is no reasonable basis, given the number of choices, for one of ordinary skill to have selected the particular claimed features out of all of the possibilities presented.

The presently claimed invention is a patentable selection invention which provides the unexpected result that, surprisingly, a combination of **both** low plasticiser level **and** low blowing agent can be achieved. This is not suggested by the cited art, taken singly or in any combination. Withdrawal of the obviousness rejection is respectfully requested.

### III. AMENDMENTS

The listing of claims has been amended to clarify that claim 18 is **not** canceled. No new matter is entered.

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Favorable action is awaited.

Respectfully submitted,

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